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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/736,480	12/15/2003	Zhigang Qi	10964-065001	3469
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FISH & RICHARDSON PC P.O. BOX 1022 MINNEAPOLIS, MN 55440-1022			EXAMINER CHUO, TONY SHENG HSIANG	
			ART UNIT 1745	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/736,480	Applicant(s) QI ET AL.	
	Examiner Tony Chuo	Art Unit 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 May 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 and 33-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-23 and 33-39 is/are rejected.
- 7) ☒ Claim(s) 4 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Claims 1-23 and 33-39 are currently pending. Claims 24-32 are cancelled. The previously stated 112 rejection of claims 1-23 and 33-39 is withdrawn. The amended claims do overcome the previously stated 102 rejection of claims 1, 2, 5, 6, 33, 35, and 39 as being anticipated by Miller. Therefore, this rejection is withdrawn. However, claims 1-3, 5-23, and 33-39 do not overcome the remaining previously stated 102 and 103 rejections. Therefore, claims 1-3, 5-23, and 33-39 stand rejected under the following 102 and 103 rejections.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 5, 6, 10, 13, 18-19, 33, 35, 37, and 39 are rejected under 35 U.S.C. 102(a) as being anticipated by Inoue et al (WO 03/034519) using (US 2004/0241078) as an English equivalent. Regarding claims 1, 2, 5, 6, 18, 33, 35, 37, and 39, the Inoue reference discloses a fuel cell comprising: a separator provided on an electrode element wherein the electrode element comprises an electrode diffusion layer

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and a catalyst layer formed on a polymer electrolyte membrane; and wherein the electrode diffusion layer is a carbon fiber woven fabric (carbon sheet) that has been treated with sulfuric acid so that a sulfonic acid moiety is covalently bonded to the carbon fiber woven fabric (See paragraph [0092] and claims 12 and 14-17).

Regarding claims 10 and 13, it also discloses treating the carbon fiber woven fabric to be hydrophilic which inherently has an initial contact angle with water of less than 125°C and has greater aqueous permeability (See paragraph [0092]).

Regarding claim 19, it also discloses a solid polymer electrolyte fuel cell which is a proton exchange membrane fuel cell (See paragraph [0001]).

4. Claims 1, 2, 5, 6, 33-35, 38, and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Mussell et al (US 5882810). The Mussell reference discloses a carbon paper that is oxidized in a medium comprising sulfuric acid in order to increase the wettability of the carbon paper (See column 8, lines 25-29). Examiner's note: A recitation of intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. Since the treated carbon paper taught by Mussell is capable of being used as a fuel cell diffusion layer, it meets the claim.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 3, 11, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al (WO 03/034519) using (US 2004/0241078) as an English equivalent, and further in view of Barton et al (US 2003/0157397). The Inoue reference is applied to claim 1 for reasons stated above.

However, Inoue et al does not expressly teach a sulfonic acid moiety wherein R is an alkyl substituted with halogen, a sulfonic acid moiety wherein R is an aryl substituted with halogen, or a proton conducting material that is perfluorinated sulfonic acid. The Barton reference discloses a carbon paper diffusion layer that has been treated with SO₃H Nafion which is a proton conductive material that is a perfluorinated sulfonic acid (See paragraph [0100]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Inoue diffusion layer by treating it with a sulfonic acid moiety wherein R is an alkyl substituted with halogen or a proton conductive material that is a perfluorinated sulfonic acid in order to further increase the hydrophilicity of the diffusion layer by utilizing a material that is known to be hydrophilic.

7. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al (WO 03/034519) using (US 2004/0241078) as an English equivalent, and further in view of Denton et al (EP 0791974). The Inoue reference is applied to claim 1 for reasons stated above.

However, Inoue et al does not expressly teach a fuel cell diffusion layer comprising a catalyst that is Pt wherein the fuel cell diffusion layer comprises from about one weight percent to about 50 weight percent of the catalyst. The Denton reference

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discloses a catalytically active gas diffusion electrode comprising a catalyst that is 40 wt% platinum supported on carbon black (See Example 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Inoue diffusion layer to include a catalyst that is Pt wherein the fuel cell diffusion layer comprises from about one weight percent to about 50 weight percent of the catalyst in order to provide a gas diffusion electrode with increased dimensional stability and flexibility that can be produced at a lower cost.

8. Claims 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al (WO 03/034519) using (US 2004/0241078) as an English equivalent. The Inoue reference is applied to claim 1 for reasons stated above.

However, Inoue et al does not expressly teach an article that has an initial contact angle with water that is at least about 15%, 20%, 30%, or 40% less than an initial contact angle of water with the diffusion layer.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Inoue fuel cell to include an article that has an initial contact angle with water that is at least about 15%, 20%, 30%, or 40% less than an initial contact angle of water with the diffusion layer because the parameter optimized is recognized in the art to be a result effective variable (In re Boesch, 617 F2d 272, 205 USPQ 215 (CCPA 1980)). The initial contact angle is a result of varying the degree of hydrophilicity of the diffusion layer.

9. Claims 20-23 are rejected under 35 U.S.C. 103(a) as being obvious over Inoue et al (WO 03/034519) using (US 2004/0241078) as an English equivalent, and further in

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view of Reddy et al (US 5132193). The Inoue reference is applied to claim 18 for reasons stated above.

However, Inoue et al does not expressly teach a fuel cell that is a direct feed liquid fuel cell, direct alcohol fuel cell, direct methanol fuel cell, or a direct propanol fuel cell. The Reddy reference discloses a direct alcohol fuel cell that is a direct feed liquid fuel cell utilizing all C₁-C₅ primary alcohols such as methanol and propanol as the fuel (See column 3, lines 15-21).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Inoue diffusion layer for use in a direct feed liquid fuel cell, direct alcohol fuel cell, direct methanol fuel cell, or a direct propanol fuel cell in order to utilize the diffusion layer in a fuel cell with liquid fuel that is easier to transport.

10. Claims 34, 36, and 38 are rejected under 35 U.S.C. 103(a) as being obvious over Inoue et al (WO 03/034519) using (US 2004/0241078) as an English equivalent, and further in view of Tabata et al (US 2002/0071980). The Inoue reference is applied to claims 1, 18, and 33 for reasons stated above.

However, Inoue et al does not expressly teach a fuel cell diffusion layer that comprises a carbon paper. The Tabata reference discloses a gas diffusion media comprising carbon fiber woven fabric or carbon paper.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Inoue fuel cell to include a fuel cell diffusion layer that comprises a carbon paper in order to utilize a gas permeable

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electroconductive sheet material that is suitable for use in fuel cells and is commercially available.

Allowable Subject Matter

11. Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The Inoue reference discloses fuel cell diffusion layer that has been treated with sulfuric acid so that a sulfuric acid moiety is covalently bonded to the diffusion layer such that there is a direct bond between the sulfur atom in the sulfonic acid moiety and the diffusion layer. However, Inoue et al does not expressly teach a sulfonic acid moiety that has the formula RSO_3H , wherein R is an alkenyl substituted with halogen or an alkyl moiety.

Response to Arguments

12. Applicant's arguments filed 5/18/07 have been fully considered but they are not persuasive.

The applicant argues that Inoue's use of 0.1N sulfuric acid in the electrolytic treatment is more likely for the purpose of increasing the electrolytic current and does not necessarily result in formation of a sulfonic acid moiety covalently bonded to the carbon fiber. The applicant is reminded that a statement of opinion cannot take the place of evidence in the record. One skilled in the art would know that a carbon fiber

fabric that has been treated with sulfuric acid would necessarily result in the formation of a sulfonic acid moiety that is covalently bonded to the carbon fiber.

The applicant also argues that the Mussell reference does not disclose the subject matter covered in the claims because Mussell focuses on teaching membrane electrode assembly having an ion exchange membrane and at least two active layers positioned on the same side of the membrane instead of a diffusion layer. The examiner disagrees because although the carbon paper is disclosed as a cathode flow field, it performs the same function as a diffusion layer. Therefore, a carbon paper that has been treated with a medium comprising sulfuric acid would necessarily result in the formation of a sulfonic acid moiety that is covalently bonded to the carbon paper.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC


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PRIMARY EXAMINER